ASM-IR Approach Proposed for NBSA

February 1, 2023

OXY GLENN SPRINGS HOLDINGS, INC.

Meeting Agenda and Collaboration Approach for NBSA Remedy Development

Technical Topics/Agenda

1. Key Attributes of NBSA Relevant to ASM
2. Merits of Interim Remedy with ASM for NBSA
3. Timelines and Tools for Verification of Goal Attainment
4. Preliminary Interim Remedy Remedial Action Objectives (RAOs) and Remedial Goals (Numerical Sediment Concentration Targets and Other Criteria)
5. Sediment Management Area (SMA) Development Methodology
6. Questions and Discussion

Objective of Today's Meeting:

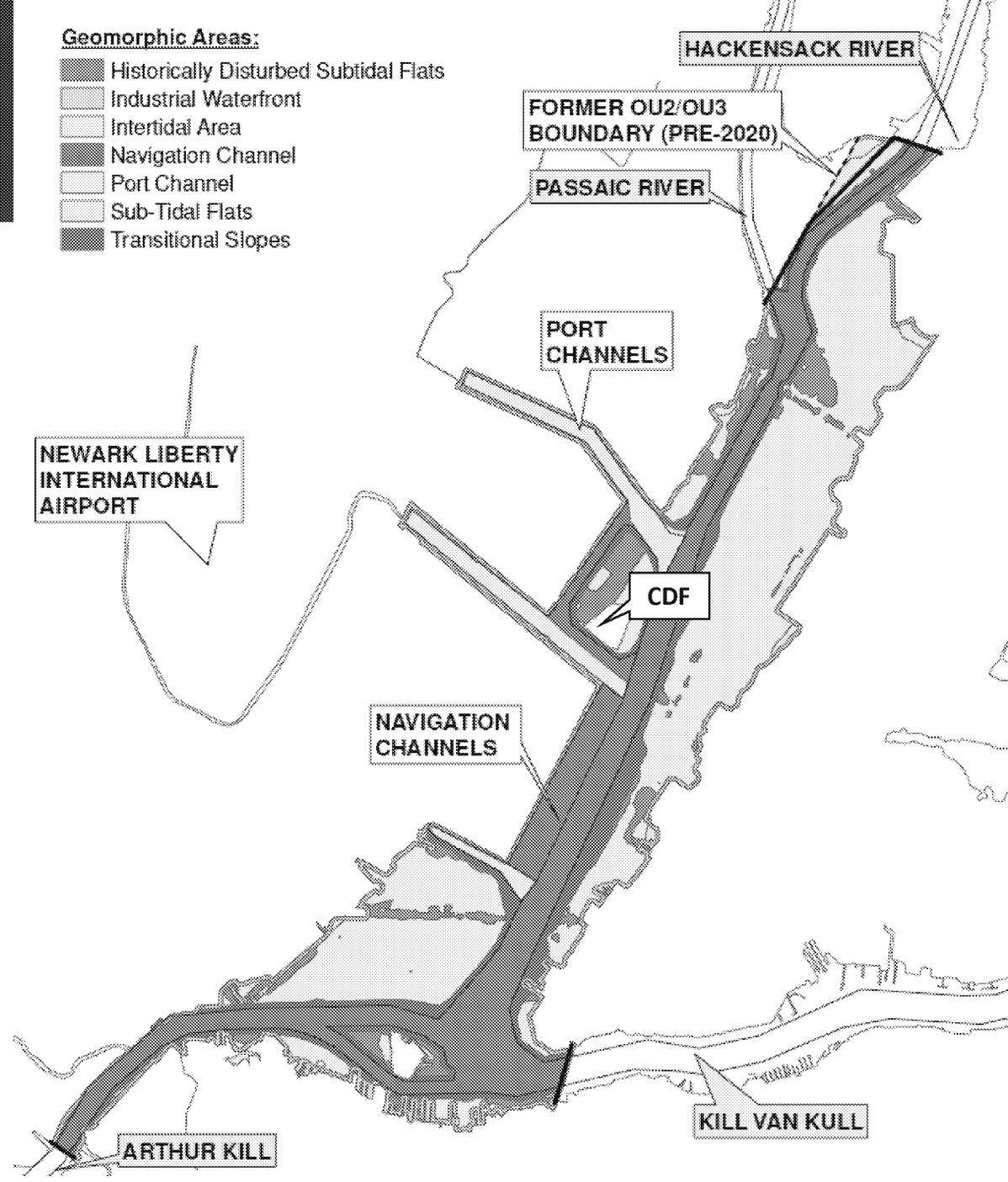
Enhance Collaboration Among Stakeholders regarding Potential ASM-IR Approach for NBSA

USEPA's guidance and experience emphasizes stakeholder collaboration as a key for successful planning of an ASM approach

- Confirm a common base of knowledge about the site and rationale for why an ASM-IR approach is proposed
- Provide additional details from specific topics to enhance discussions and foster collaboration
- Solicit feedback
- Collaborate to develop the goals/targets, focus areas, implementation timeline, future monitoring, and ASM framework
- Lay groundwork for topics needing more detailed discussions in future meetings
- Review frequency and type of collaboration going forward

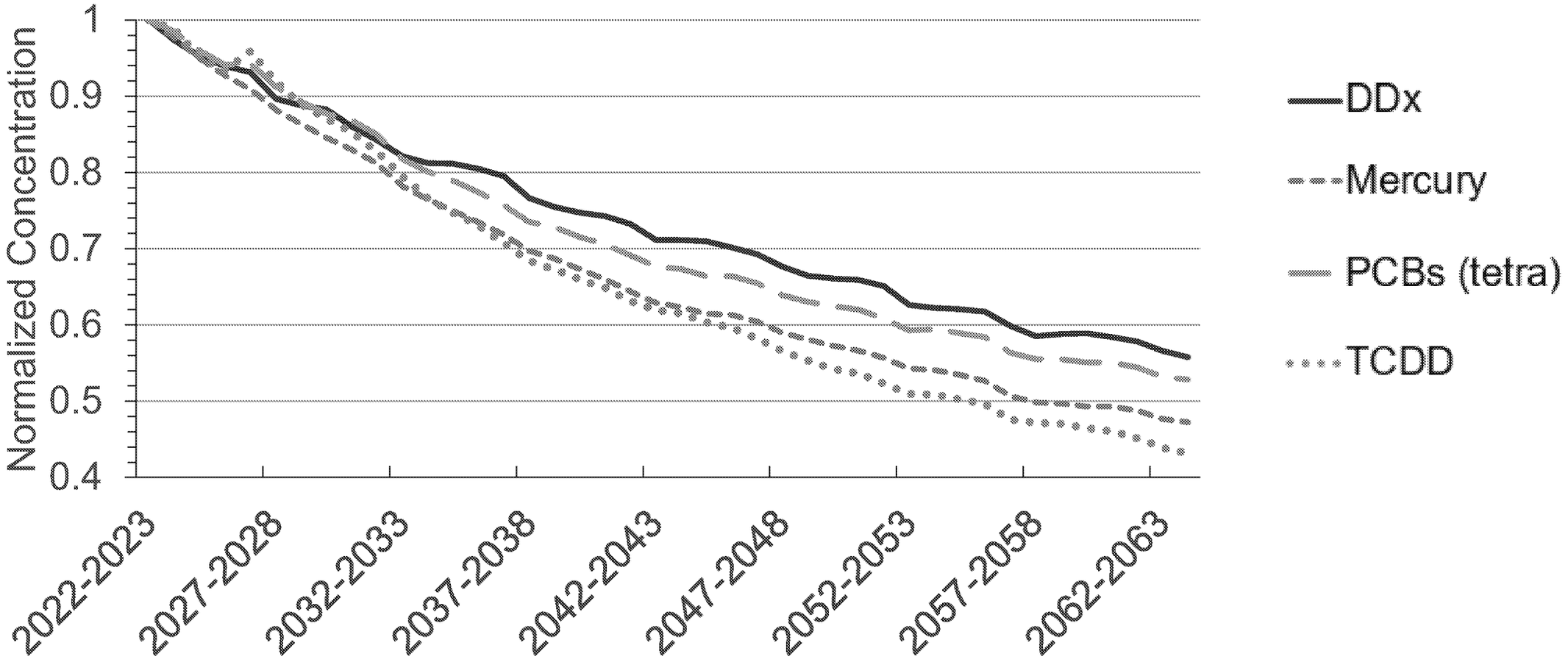
Key Attributes of the NBSA Relevant to ASM Discussions

- NBSA contains distinct geomorphic areas
- Ongoing inputs from four connected waterways impact recovery of NBSA, and are focus of remedial programs in the region
- Approximately 80% of the sediments deposited are captured in the navigational channels
- BAZ depth is approximately 6 inches
- SEDFlume tests show highest stability in areas of elevated COCs in the southeast and southwest flats and that sediments below the BAZ are unlikely to be eroded
- Hurricane Sandy had no apparent impact on surface sediment COC recovery



Forecasted Declines in Surface Sediment COC Concentrations

- Risk recovery supported by declining surface sediment concentrations measured during RI and projected by USEPA's CFT model

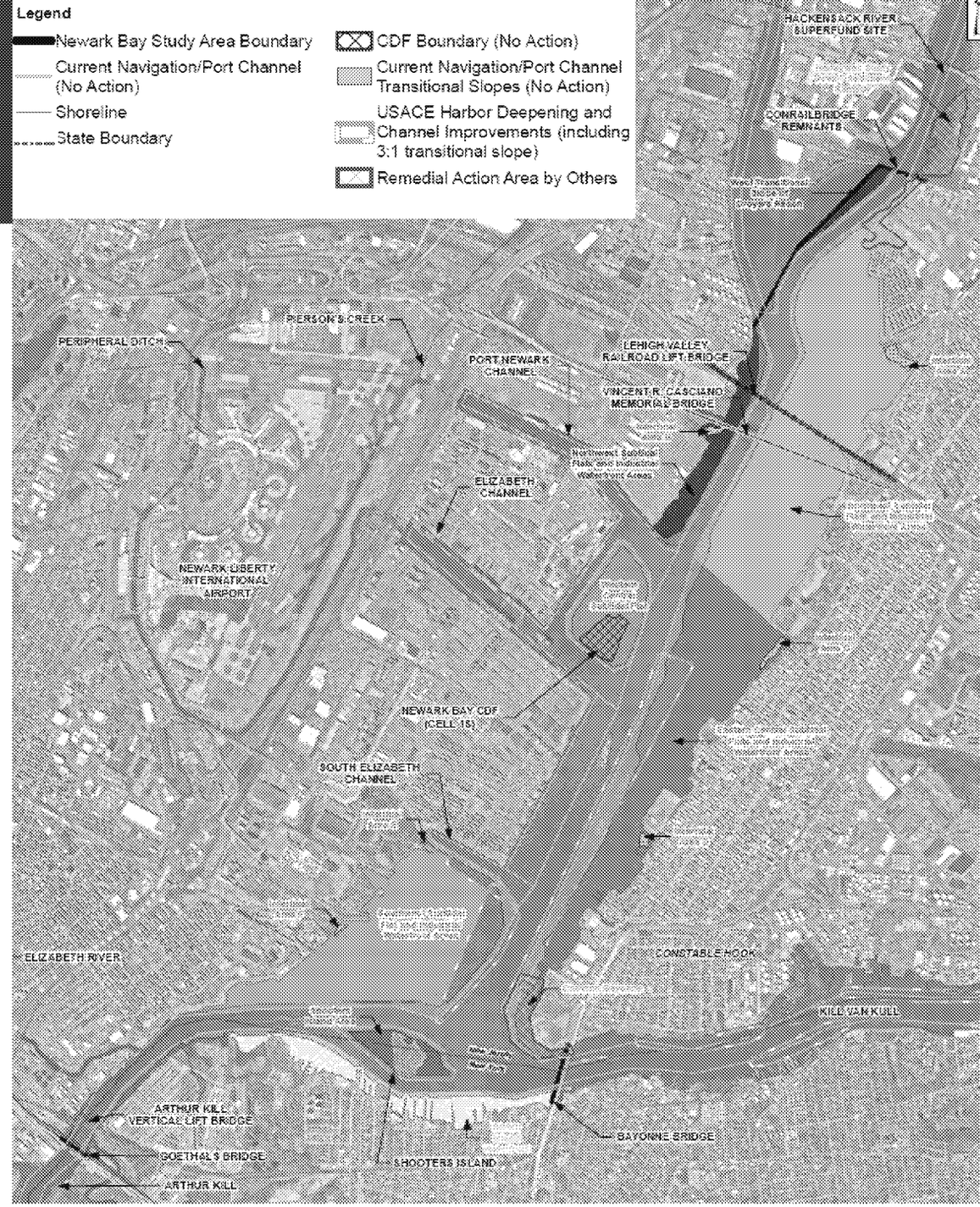


Identifying Areas of Interest (AOIs) as Potential Priority Areas for Remediation

- Two notable areas of locally elevated surface sediment COC concentrations that generally persist in the CFT model and are above predicted toxic thresholds
  - Southwest Subtidal Flat
  - Near Newark Bay Bridge
- AOIs present opportunities for focused action to reduce risk

Draft FS Subareas

- Northwest Subtidal Flats and Industrial Waterfront Areas
- West Transitional Slope of Droyers Reach
- Northeast Subtidal Flats and Industrial Waterfront Areas
- Eastern Central Subtidal Flats and Industrial Waterfront Areas
- Shooters Island
- Southwest Subtidal Flat and Industrial Waterfront Areas
- Staten Island Waterfront
- Western Central Subtidal Flat
- Intertidal Areas



Planned Future Activities that will Impact NBSA CSM

Remedial Programs in Connected Waterways	Approximate Timing
Lower 8.3 Miles of LPR	Mid-2020s to Mid-2030s
Upper 9 Miles of LPR**	Mid-2020s to Mid-2030s
Hackensack River	To be determined
State-led Projects in Newark Bay, Kill Van Kull, or Arthur Kill	Ongoing
Construction Projects in NBSA and Connected Waterways	**Approximate Timing**
USACE Harbor Deepening and Channel Improvements	2025 to 2040
Potential NY/NJ Port Expansion under 2050 Master Plan	2020s to 2050 (NBSA-specific work TBD)
Newark Bay-Hudson County Extension (Newark Bay Bridge)	Late 2020s
NY/NJ Harbor and Tributaries Study (HATS)	2030s to 2040s (if constructed)

Note:
**Adaptive, multi-phased approach selected by USEPA
1. The list of remedial actions is not an exhaustive list of upland and in-river remedial actions that are on-going or planned in the NBSA and connected waterways.

Key Uncertainties that Favor ASM as a Pathway to Final Remedy

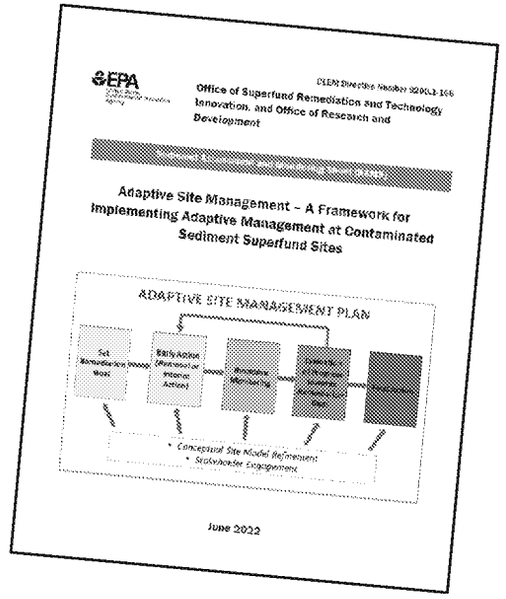
- Timing and impact of remedial programs and construction projects over the next 15 years
- Changes in inputs from connected waterways
- Evolving CSM due to changes in site conditions
- Linkage between sediment and biota
- Overall rate of recovery and recovery end points

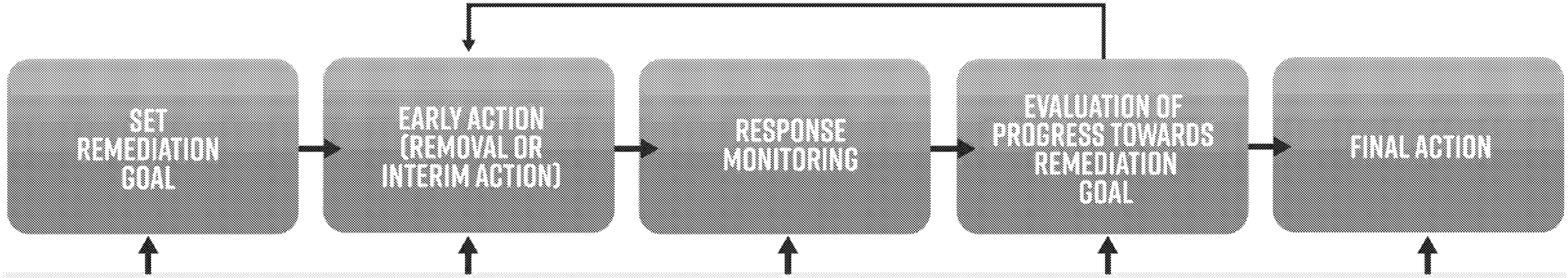
Proposed ASM-Interim Remedy Concept

- Balances what we know regarding current risks while informing what we do not know regarding long-term CSM evolution and site recovery
  - Develop and implement an IR focused on localized risks and elevated concentrations in the southwest and northeastern subtidal flat areas (i.e., “Areas of Interest”) that are unlikely to recover naturally in a reasonable timeframe
    - Footprint of the IR designed to achieve significant risk reduction, supported by additional sampling to define the areas
    - Specific remediation approach to be selected through an FS process
    - Potential for coordination of IR construction with OU2 RA
  - Implement data collection programs to monitor NBSA conditions before, during, and after IR and other projects in NBSA and connected waterways
  - Evaluate system response and overall recovery and take appropriate action, if necessary
  - Develop Final Remedy/ROD based on updated CSM and observed system recovery as supported by long-term data collection

Proposed ASM-Interim Remedy Concept

- Consistent with USEPA sediment management principles, CSTAG recommendations, ASM guidance, and regional precedents
  - Address ongoing sources to avoid recontamination
  - "CSTAG recommends the Region evaluate whether early actions or interim actions could be used to quickly reduce risks…. This risk management approach could facilitate decisions and site actions otherwise complicated by determinations of source control." – CSTAG comments
  - "This approach allows work to proceed in areas with high contaminant exposure and transport while additional data collection and testing of responses is conducted to determine the appropriate level of remediation in remaining areas." - SAMS June 2022
  - Other sites in region with ASM-IR based approach
    - Upper 9 Miles of Lower Passaic River Study Area (OU4)
    - Berry's Creek Study Area/Universal Oil Products





ADAPTIVE SITE MANAGEMENT POTENTIAL ELEMENTS

- Develop Interim RAOs and Post-Remedy Targets
- Develop FS, including ASM and LTM Plans
- Issue Interim ROD

- Design and Implementation of NBSA Interim Remedy
- Implementation of Other Regional Remedial Programs and Construction Projects

- Monitor NBSA Response to IR and Regional Remedial Program and Construction Projects
- Monitor Evolution of NBSA CSM and Recovery Trends
- Monitor Evolution of Regional Background Conditions

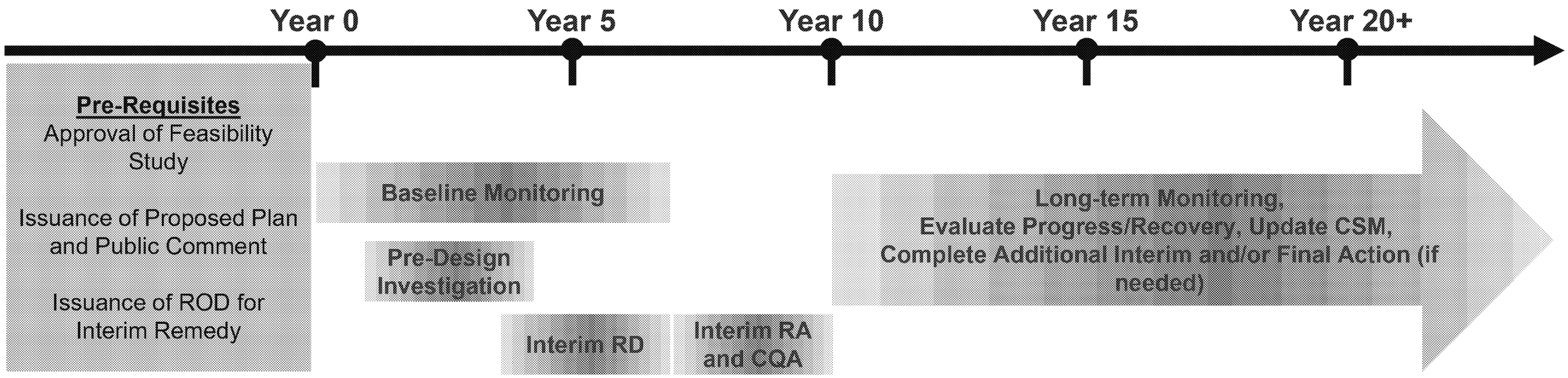
- Review Monitoring Data at Evaluation and Decision Timepoints to Assess Progress towards Remedial Goal
- Evaluate Need for Additional Action(s)

- Development of Final Remedy/ROD
- Final Remedy Implementation
- Continued Monitoring Under 5-Year Reviews

Conceptual ASM Framework for NBSA

Adapted from Source: USEPA. 2022. *Adaptive Site Management – A Framework for Implementing Adaptive Site Management at Contaminated Sediment Superfund Sites*. Office of Superfund Remediation and Technology Innovation, and Office of Research and Development. June.

Conceptual Adaptive Site Management Timeline



Adaptive Management: Preliminary Metrics, Triggers, and Responses

Proposed RAO	Monitoring Metrics	Potential Triggers	Potential Responses
Reduce human health and ecological risks by remediating areas containing elevated COC concentrations in surface sediment	Post-remedy verification sampling of surface sediment	Sediment concentrations remain above the post-remedy target that will not achieve adequate risk reduction	• Additional data collection • Confirmation of CSM • Potential additional action
Enhance recovery by remediating areas containing elevated COC concentrations in surface sediment	Baseline and long-term monitoring of surface sediments	Sediment concentrations are remaining above the predicted range and recovery rates are slower than predicted	• Additional data collection • Confirmation of CSM • Potential additional action
Reduce benthic invertebrate risks by remediating areas exhibiting predicted benthic toxicity due to elevated COC concentrations in surface sediment	Baseline and long-term sediment monitoring vs. toxicity thresholds	Prevalence of predicted toxicity is not adequately reduced	• Benthic toxicity testing • Evaluation of causes of toxicity • Potential additional action

Interim Remedy Proposed RAOs for NBSA

1. Reduce human health and ecological risks by remediating areas containing elevated COC concentrations in surface sediment
2. Enhance recovery by remediating areas containing elevated COC concentrations in surface sediment
3. Reduce benthic invertebrate risks by remediating areas exhibiting predicted benthic toxicity due to elevated COC concentrations in surface sediment

Interim RAOs to be finalized in collaboration with USEPA and NJDEP

Post-Remedy Target Considerations

- **RAO #1 (Post-construction)**
  - Human Health Cancer (10^{-4}) and Noncancer Sediment Interim Values
  - Human Health Cancer (10^{-4}) and Noncancer Sediment RMEs
  - Ecological Lowest Attainable Integrated Value
  - Ecological Direct Contact Toxicity Risk to BIC
- **RAO #2 (30 years Post-construction)**
  - EPA's Proposed KVK Background Concentrations
  - Percent Reduction from Phase III RI Site-wide SWAC
- **RAO #3 (Post-construction)**
  - Reduction from Phase III RI Area Predicted to Exhibit Toxicity

Interim RBTs to be finalized in collaboration with USEPA and NJDEP

SMA Development Path

1. Use hilltopping approach in southwest and northeast subtidal flat areas (i.e., "Areas of Interest") to identify SMAs to meet select RBTs post-construction

2. Adjust SMAs such that 30 years post-construction, site-wide SWACs are estimated to approach target values

3. Adjust SMAs to further address areas exceeding benthic toxicity threshold concentrations, as appropriate

4. Complete development of SMAs to adjust for constructability related concerns while maintaining remedial effectiveness

Example Results of SMA Steps 1 & 2

- ✓ Achieves multiple RBT concentrations post-construction for southwest and northeast subareas, providing meaningful risk reduction in areas of co-located COCs, elevated concentrations, and greatest risk
- ✓ Addresses areas of bay where elevated COC concentrations are projected to persist
- ✓ Sets site-wide estimated recovery trajectory to approach observed KVK concentrations 30 years post-construction
- ✓ Addresses areas of the bay where toxicity has been observed or is predicted based on sediment COC concentrations

<u>Preliminary Area = 167 acres</u>

Further development of areas to balance predicted effectiveness, uncertainty, and constructability

Preliminary SMA Evaluation					Sediment Human Health RBTs				Ecological RBT
					RMEs		Interim RBTs		
COCs	Units	2035/Post-IR SWAC (FS Subarea)		2035 SWAC (NBSA)	Cancer (10^{-4})	Noncancer	Cancer (10^{-4})	Noncancer	Lowest Attainable Integrated PRG
TCDD	ng/kg	NE	27	28	49	6.7	160	**40**	38
		SW	21						Observed KVK Concentration = 15
PCBs	µg/kg	NE	138	187	790	UA	3,700	**310**	360
		SW	245						Observed KVK Concentration = 400
DDx	µg/kg	NE	12	27	23,000	360	110,000	**2,100**	130
		SW	55						Observed KVK Concentration = 20
Mercury	mg/kg	NE	0.5	0.8	--	1.1	--	**18**	0.27
		SW	1.2						Observed KVK Concentration = 0.7
Arsenic	mg/kg	NE	8	10	Risk-based target concentrations based on cancer (10^{-4}) and noncancer RMEs or interim exposure scenarios for lead, arsenic, nickel, and total alkylated PAHs are not applicable.				0.033
		SW	15						Observed KVK Concentration = 10
Lead	mg/kg	NE	80	70					49
		SW	147						Observed KVK Concentration = 75
Nickel	mg/kg	NE	20	26					0.0001
		SW	24						Observed KVK Concentration = 35
Alky. PAHs	µg/kg	NE	5,500	5,400					Direct contact tox = 29,000
		SW	10,700						

Green-highlighted cells indicate surface sediment concentrations are forecasted to be below RBTs NBSA-wide following implementation of the interim remedy. Bold indicates lowest HH Interim RBT.

Comparison to RBTs: BERA Assessment Zones

Preliminary SMA Evaluation				Sediment Human Health RBTs				Ecological RBT
				RMEs		Interim RBTs		
COCs	Units	2035/Post-IR SWAC (BERA Assessment Zones)		Cancer (10^{-4})	Noncancer	Cancer (10^{-4})	Noncancer	Lowest Attainable Integrated PRG
TCDD	ng/kg	N	39	49	6.7	160	**40**	38
		SE	33					Observed KVK Concentration = 15
		SW	20					
PCBs	µg/kg	N	183	790	UA	3,700	**310**	360
		SE	217					Observed KVK Concentration = 400
		SW	220					
DDx	µg/kg	N	13	23,000	360	110,000	**2,100**	130
		SE	17					Observed KVK Concentration = 20
		SW	50					
Mercury	mg/kg	N	0.7	--	1.1	--	**18**	0.27
		SE	0.8					Observed KVK Concentration = 0.7
		SW	1					

Green-highlighted cells indicate surface sediment concentrations are forecasted to be approaching or below RBTs following implementation of the interim remedy for one or more BERA assessment zones.
Bold indicates lowest HH Interim RBT.

Comparison to RBTs: BERA Assessment Zones

Preliminary SMA Evaluation				Sediment Human Health RBTs				Ecological RBT
				RMEs		Interim RBTs		
COCs	Units	2035/Post-IR SWAC (BERA Assessment Zones)		Cancer (10^{-4})	Noncancer	Cancer (10^{-4})	Noncancer	Lowest Attainable Integrated PRG
Arsenic	mg/kg	N	8	Risk-based target concentrations based on cancer (10^{-4}) and noncancer RMEs or interim exposure scenarios for lead, arsenic, nickel, and total alkylated PAHs are not applicable.				0.033
		SE	11					Observed KVK Concentration = 10
		SW	13					
Lead	mg/kg	N	83					49
		SE	113					Observed KVK Concentration = 75
		SW	126					
Nickel	mg/kg	N	21					0.0001
		SE	29					Observed KVK Concentration = 35
		SW	26					
Alky. PAHs	µg/kg	N	6,260					Direct contact tox = 29,000
		SE	4,900					
		SW	8,300					

Green-highlighted cells indicate surface sediment concentrations are forecasted to be approaching or below RBTs following implementation of the interim remedy for one or more BERA assessment zones.

Questions and Discussion